bits = {0, 1}
8 bits = 1 byte
1024 bytes = 1 KB
1024 KB = 1 MB

} keeps on increasing "Google for deep dive"

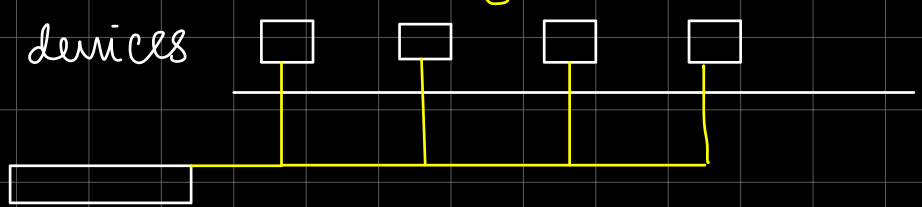
Through Put: Maximum data sent or recieved by the devices.

Deep dive NICs:- (Network Interface Card)

- It is a hardware component that is necessary for a device to connect over a network.
- wireless / wired both need NIC.
- It allows connection over LAN as well WAN through Internet Protocols (IP)

Question :-

Through Put = 100 mbps.



1 Gbps internet speed.

max speed for devices ? 100 mbps

Vice Versa is also true!

got to know such a great thing about "How to test your internet speed" ☺

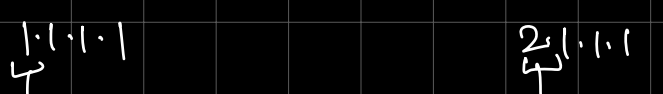
First Practical! (Labs not free I guess)

we will see how we transfer data b/w them.

- **Classes of IP addresses:-**

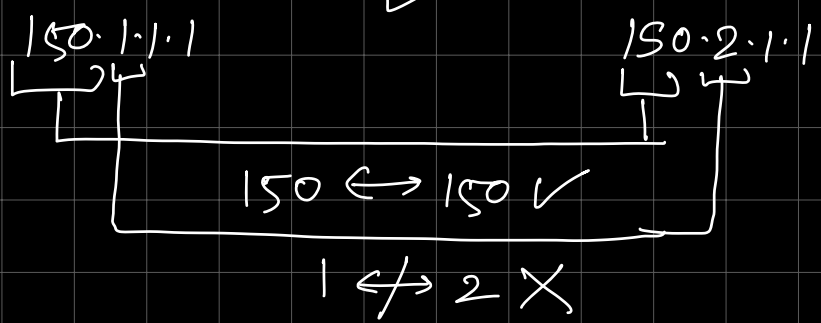
(A) when starting from 1–126 N.H.H.H

✓ yes they match! ⇒ they communi-cate



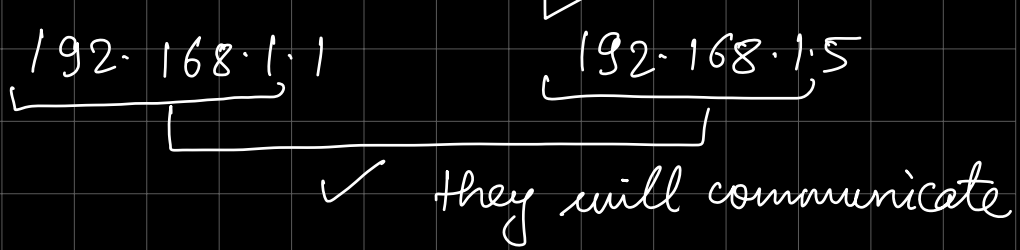
✗ they do not match! ⇒ they will not communicate.

(B) when starting from 128-191, we check two parts N.H.H.H



they will not communicate

(C) when ranging from 192 — 223, we check three parts N.N.N.H



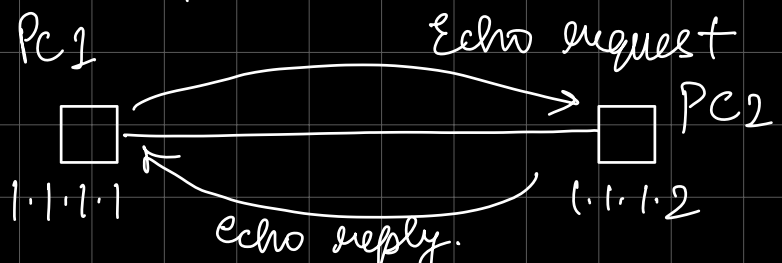
*We use subnetting for connecting the ones that are not connected.

127 ones that are missing are the loop back IPs, for testing!

— self host IP / these are your internal IPs. they cannot be accessed from outside.

This lab contains practical implementation & explanation of IPV4. "Watch it!"

"Ping" :- Packet internet gopher. (Packets)
- It is used to check connectivity b/w devices.



$ Ping 1.1.1.2 (from 1.1.1.1)

$ Ping statistics for 1.1.1.2
Packet sent - 4, received - 4 0% loss
// it means the devices are connected

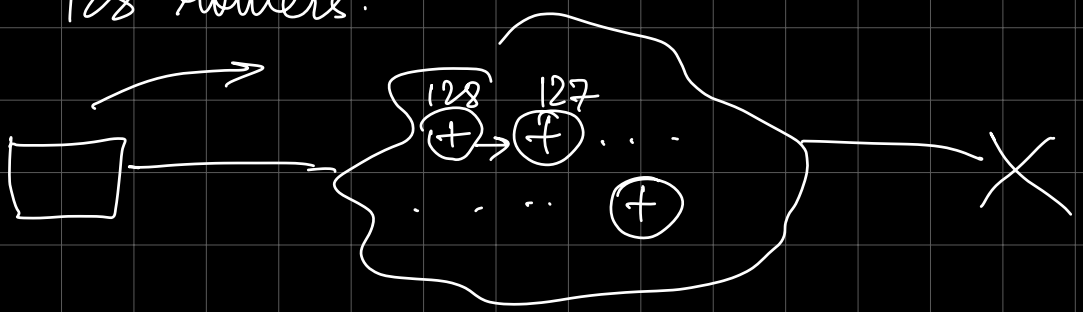
- the Ping is an Echo request, it is a code (type code 8)

"delay / latency" :-

$ time = 2ms
time = 1 ms
] this show the time taken for echo reply

"TTL" :- time to live
- TTL is like the expiry date of the Packet

- if TTL = 128 => that the data packet will be dropped/discarded after 128 routers.



- On every router, the TTL count will be decreased by "1" when reaches zero "0" the packet is dropped.
- To prevent loops, concept of TTLs was added.

"Subnet mask" :- Explore

"DHCP" :- Automatic IP address provided when connected to a router

---

IP address :-

- IPV4
  - 32bit
  - 32bits
  - X.X.X.X
- IPV6
  - 16 bit
  - 128 bits
  - X.X.X.X.X.X.X.X

200.1.1.1
decimal format

2001 : 1234 : 0000 : 0000 :
0123 : CAFE : 1234 :
1111

- this also includes hexa decimal codes

"we use IPV6 because there is a shortage of IPV4, a lot of them are already in use"

- Decimal to binary : (imp for subnetting)

192 . 168 . 1 . 1

- this is the part which we learn in DLD.

~ short notes !!

X . X . X . X

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
128	64	32	16	8	4	2	1

to represent 192 in binary:

192 = 11000000

168 = 10101000

1 = 00000001

1 = 00000001

- why do we use classes in IPV4:

IANA: Internet assigned number Authority

X . X . X . X

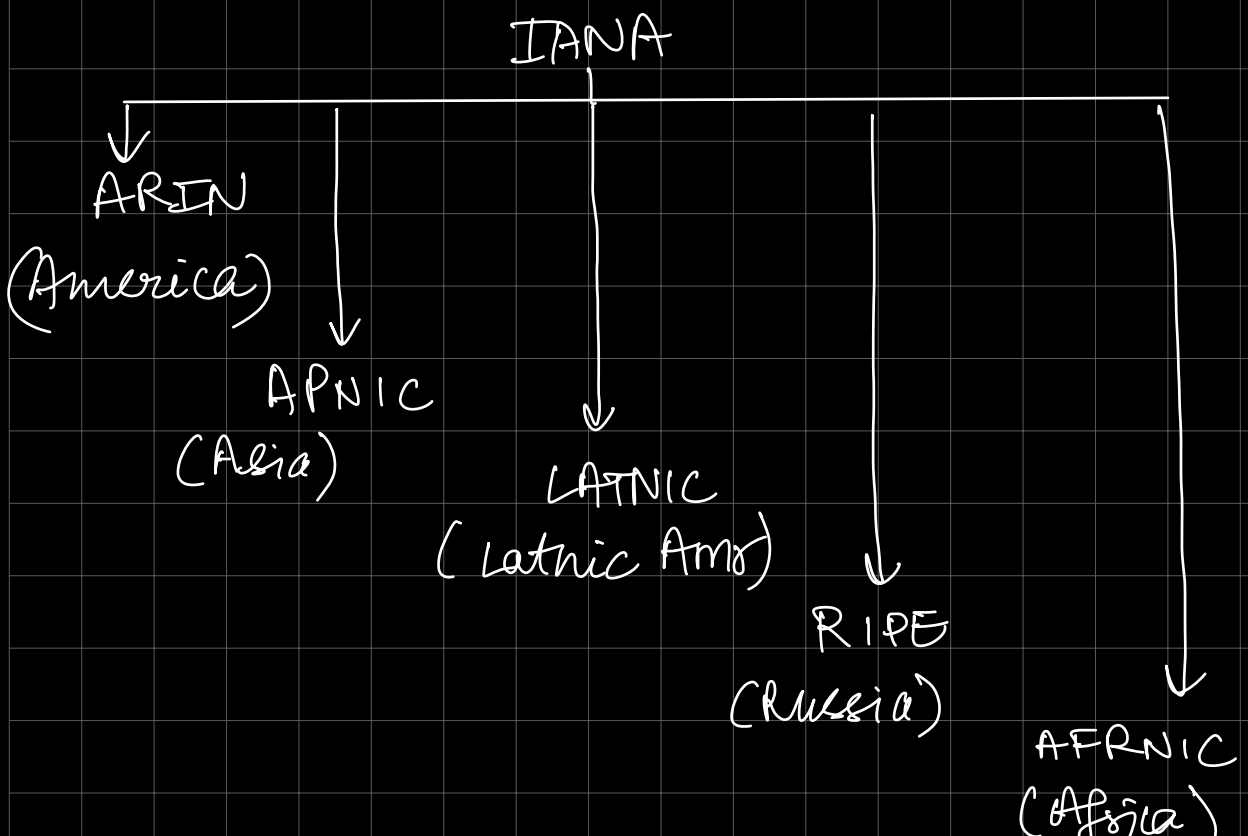
	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	
	128	64	32	16	8	4	2	1	
→	0	0	0	0	0	0	0	0 = 0–127	(A)
→	1	0	0	0	0	0	0	0 = 128–191	(B)
→	1	1	0	0	0	0	0	0 = 192–223	(C)
→	1	1	1	0	0	0	0	0 = 224–239	(D)
→	1	1	1	1	0	0	0	0 = 240–225	(E)

- IANA classified the addresses depending

upon the presence of "1"s present, starting from MSB.

- More about IANA :-

  if you want to buy IP addresses go to RIR (Regional internet Registury)



APNIC :- Asia Pacific network information center

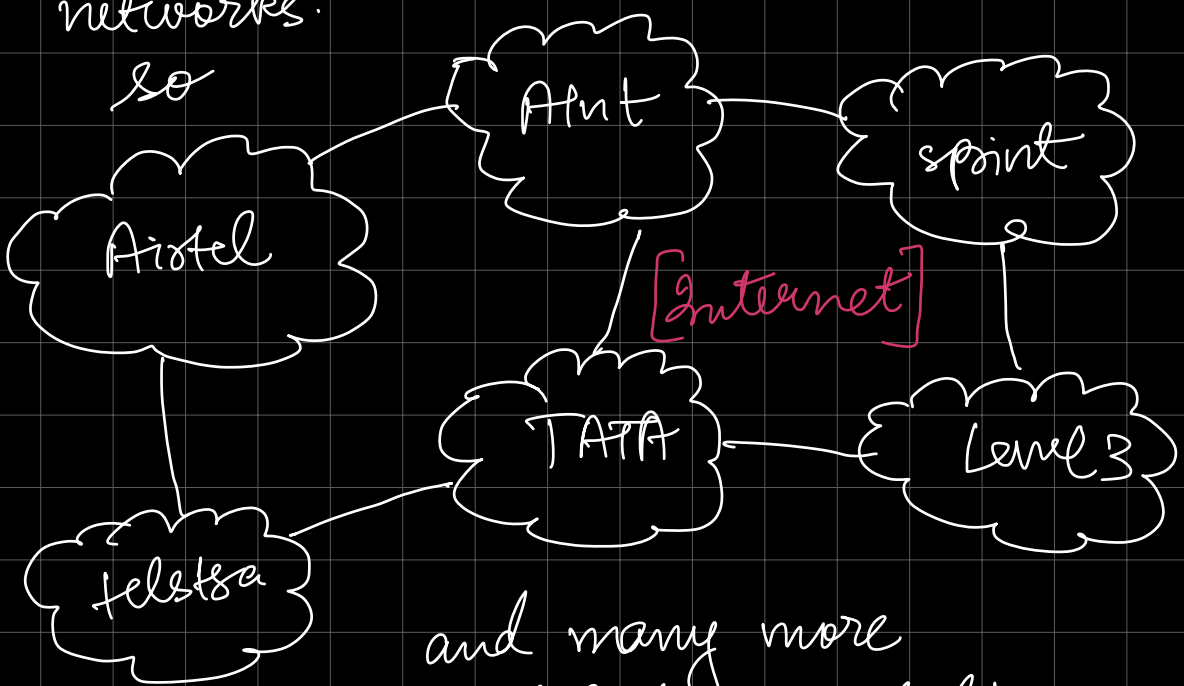
- to buy IP address in Asia Pacific region

• from where are we getting internet ?

Airtel = Internet Service Provider

as we know, internet is network of networks.

so

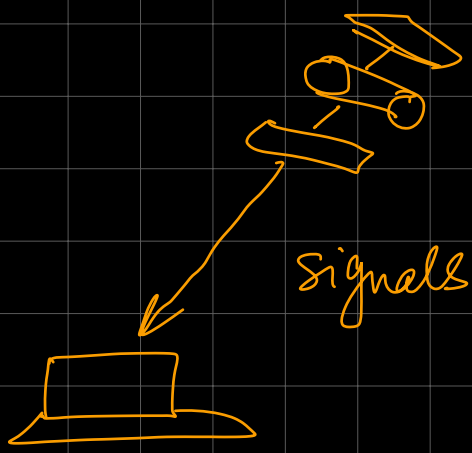


and many more "interconnected"

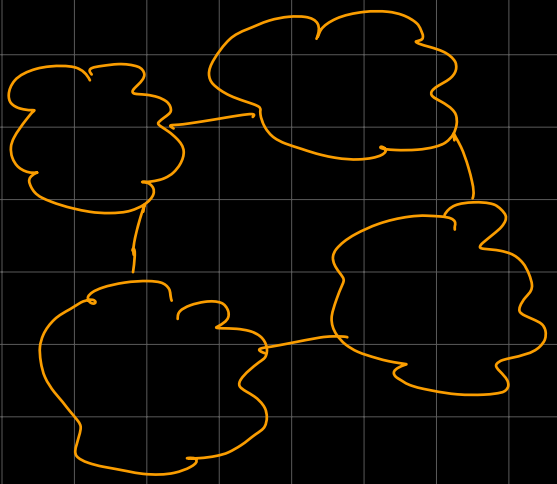
How it started :-

cold war b/w Russia & America

Russia	USA
→ Satellite - Sputnik	→ DARPA
• they connected with the help of satellite	→ NASA
	• they connected



with the help of underwater cables



→ different defense sites were connected

→ when it got famous, they released a public version of it ARPA.

Tier 1 ISP :- (15-20 providers)

- They are the ones who put the cables under the sea.
- India = TATA.

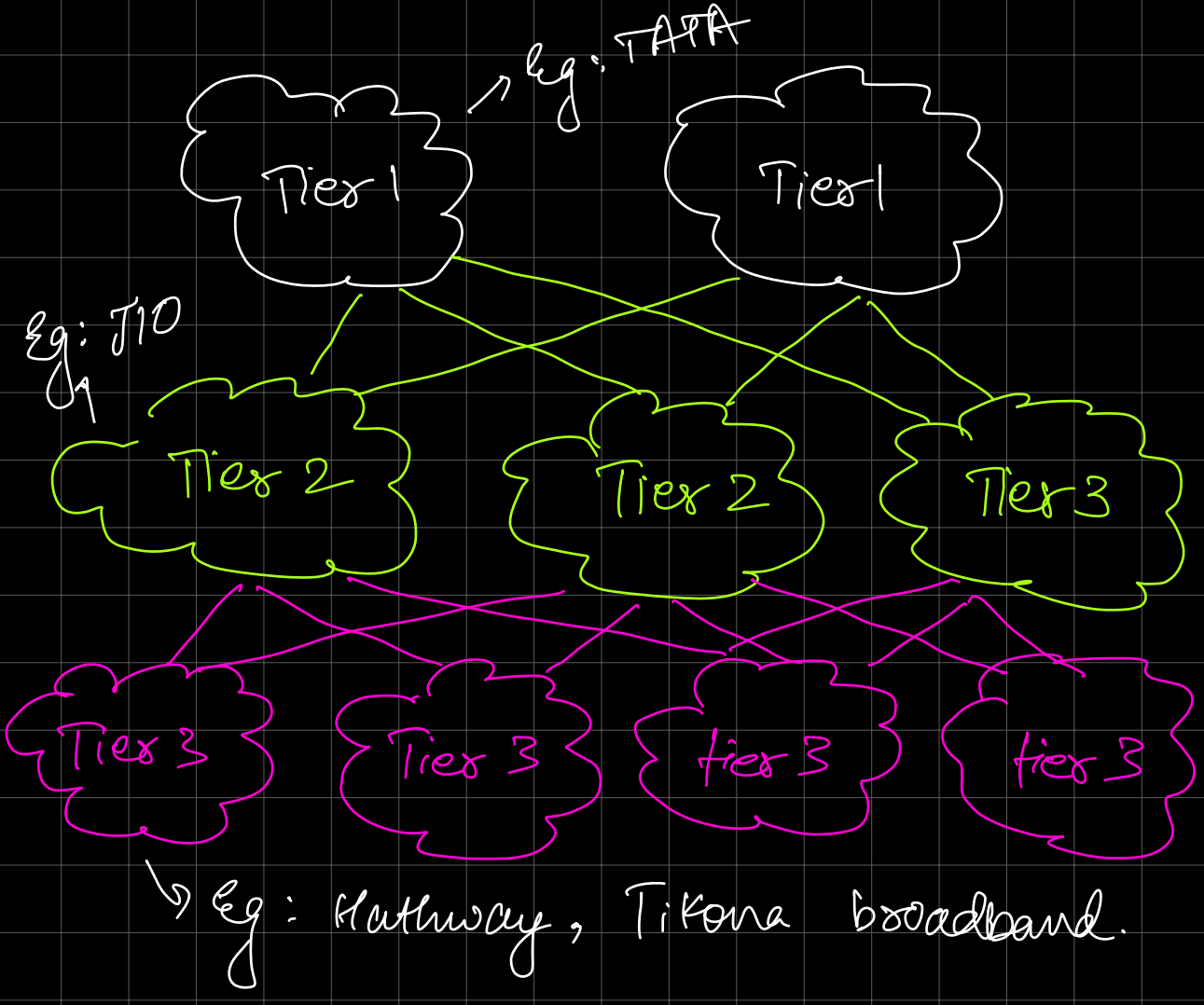
Tier 2 ISP :-

- they take connection from tier 1 &

provide internet to tier 3.

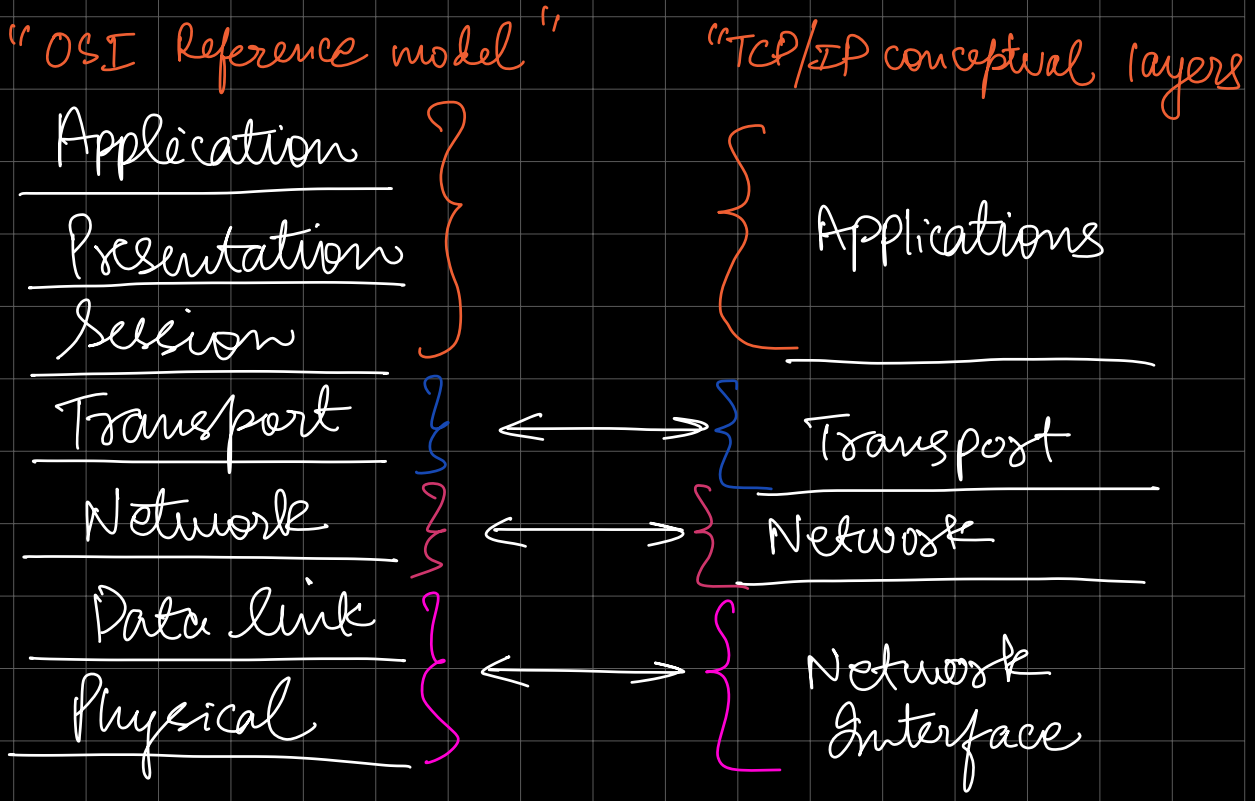
Tier 3 ISP :-

- they are the local ISPs. providing us internet.

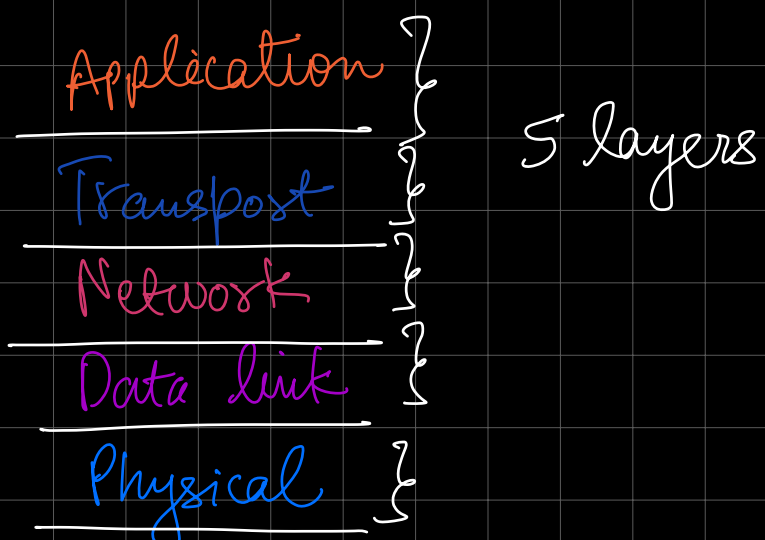


↳ eg: Hathway, Tikona broadband.

#OSI Model & TCP/IP :



- latest version of TCP/IP (5 layers)



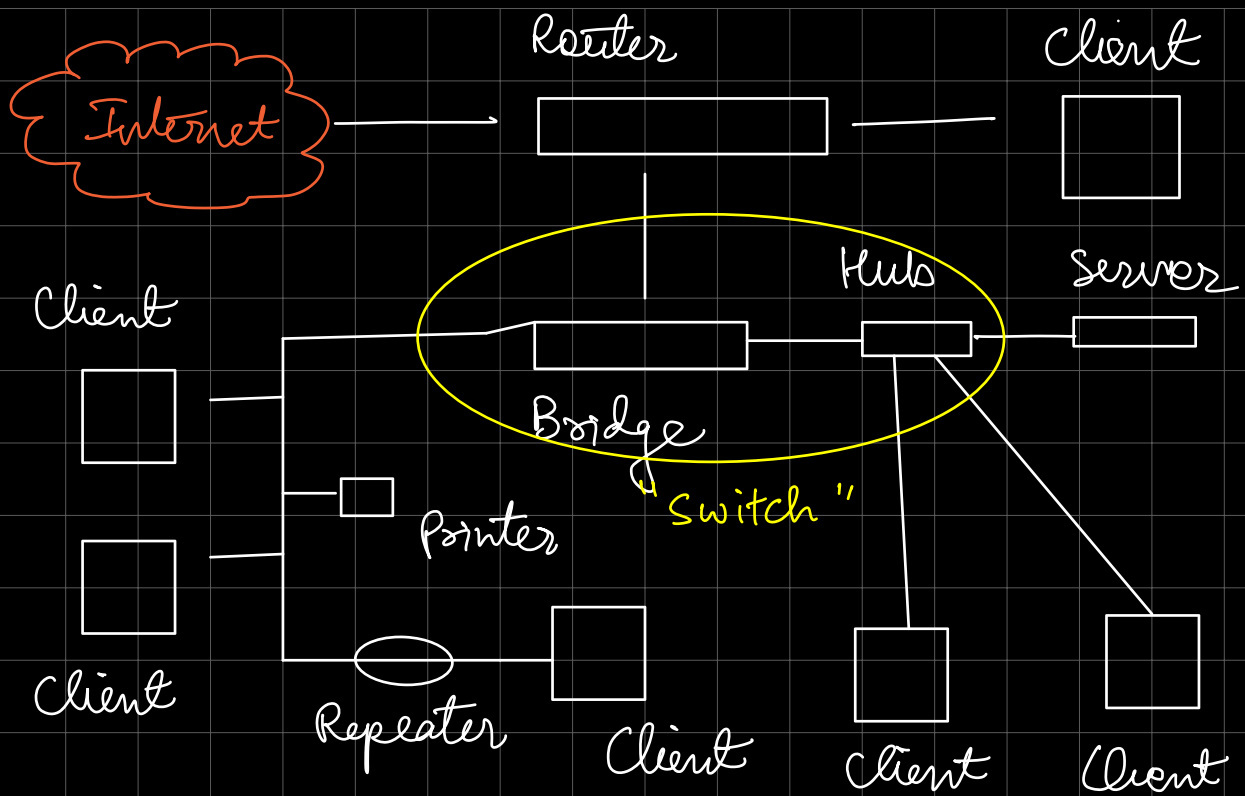
- the basics of understanding are "OSI" model after that TCP/IP becomes easy.

"All People seem to Need Data Processing"

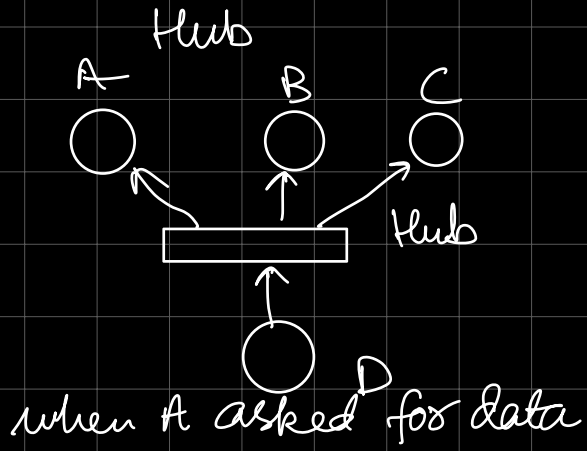
APSTNDP → Alias to learn it.

Protocols :- these are the set of rules so the OSI model, TCP/IP, these are all Protocols.

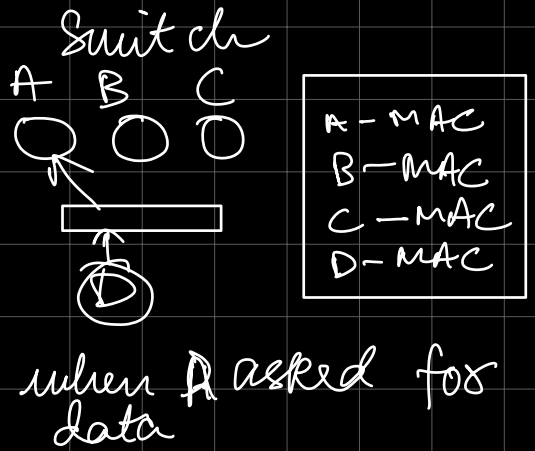
- all windows machines / macbooks / routers etc when they want to connect to the internet, they are following TCP/IP Protocols.
- "the internet rules"



- Router : Used to connect different networks with each other
- Hub: We use Switches now
- Client : Are the connected devices.



when A asked for data



when A asked for data

- It works just like a power extension chord, same data sent to every device, wether asked or not - It does not care about MAC addresses	- Switches maintain a table of MAC addresses. - Switch knows the address of the device, ∴ only sends data to the device which actually asked for it

"Hub always does Broadcasting"

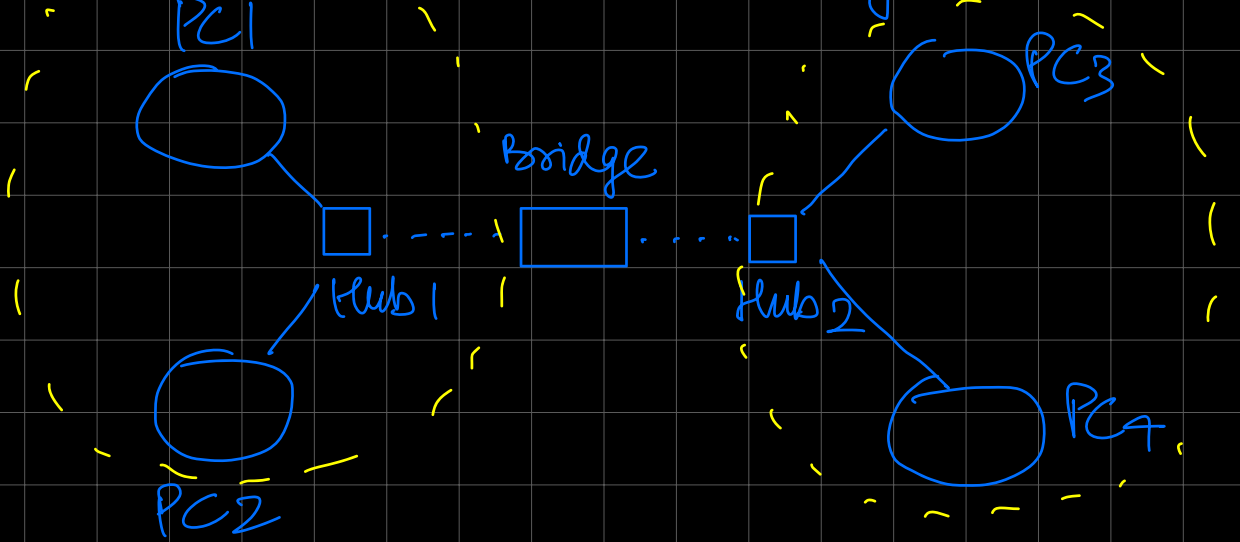
Unicast :- When one computer sends data to one device, it is "unicast."

Multicast :- When one device is sending data to multiple device it is called "Multicast"

Brodcasting :- When one device is sending data to all the devices, it is called "Broadcasting".

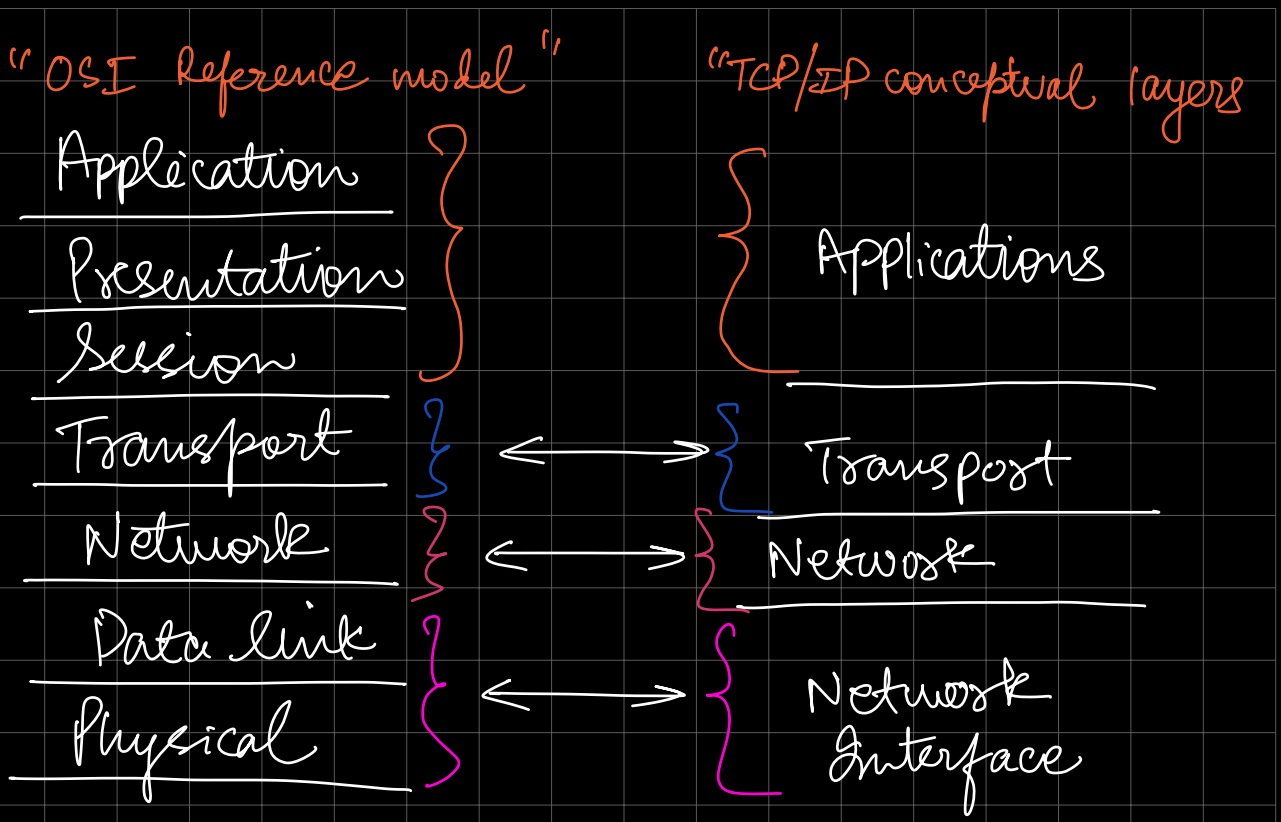
→ Initially switch also broadcasts, then store the addresses of the devices, then it only unicasts

- Bridge: We use bridge to limit the broadcast created by hubs,



- Bridge used to store MAC addresses.
- It limits the broadcasting.

- Switch :- Bridge + Hub
  - more number of ports



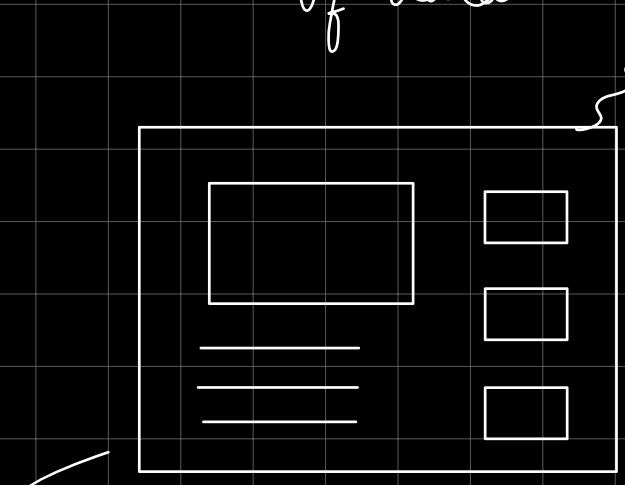
- Application layer: Softwares or Protocols which interact one human to other work in the application layer.

Eg: Webbrowsers: HTTP, HTTPS etc. all these protocols come under Application layer.

FTP:- file transfer protocol

Telnet :- for remote access to a device
or
SSH (more secure)

- Presentation layer :- tells about the format of data



- So, it is responsibility of presentation layer to show the data in the correct form
- It also performs the task of Encryption & Decryption.
- Compression / Decompression

- Session layer :- Create & maintain the sessions. "timeframes".

Eg: lets say you login into your

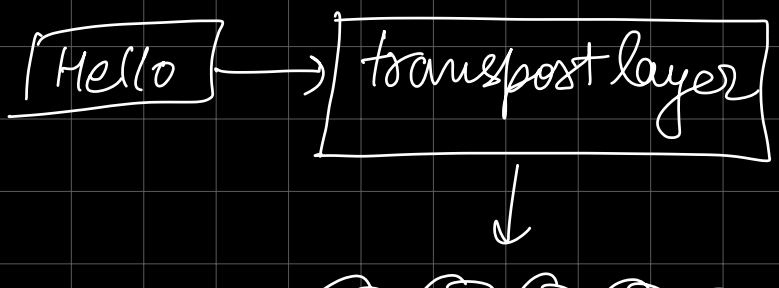
Bank website. If you dont interact with it for a while your session will end & you will be logged out.

- developers code it into the sessions Program.

" Above three layers together fall in the application layer ".

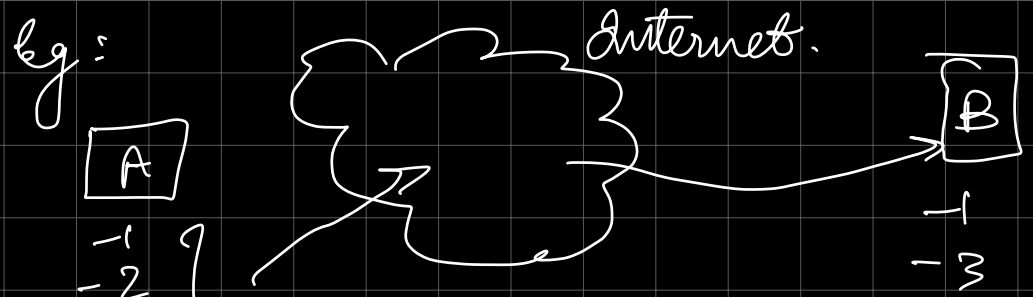
- Transport layer :- "Segmentation" of the data takes place here

- It will be broken down in small parts

eg: 

- also responsible for "sequencing" i.e. it will add a number to the data.

eg:



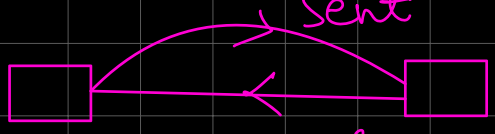
"2 was dropped"
So it will ask for it again.
"Retransmission"

There are two protocols on this layer

Data

TCP

- when packet received on the other side, it sends an "acknowledgement" back.



"Transmission Control Protocol"

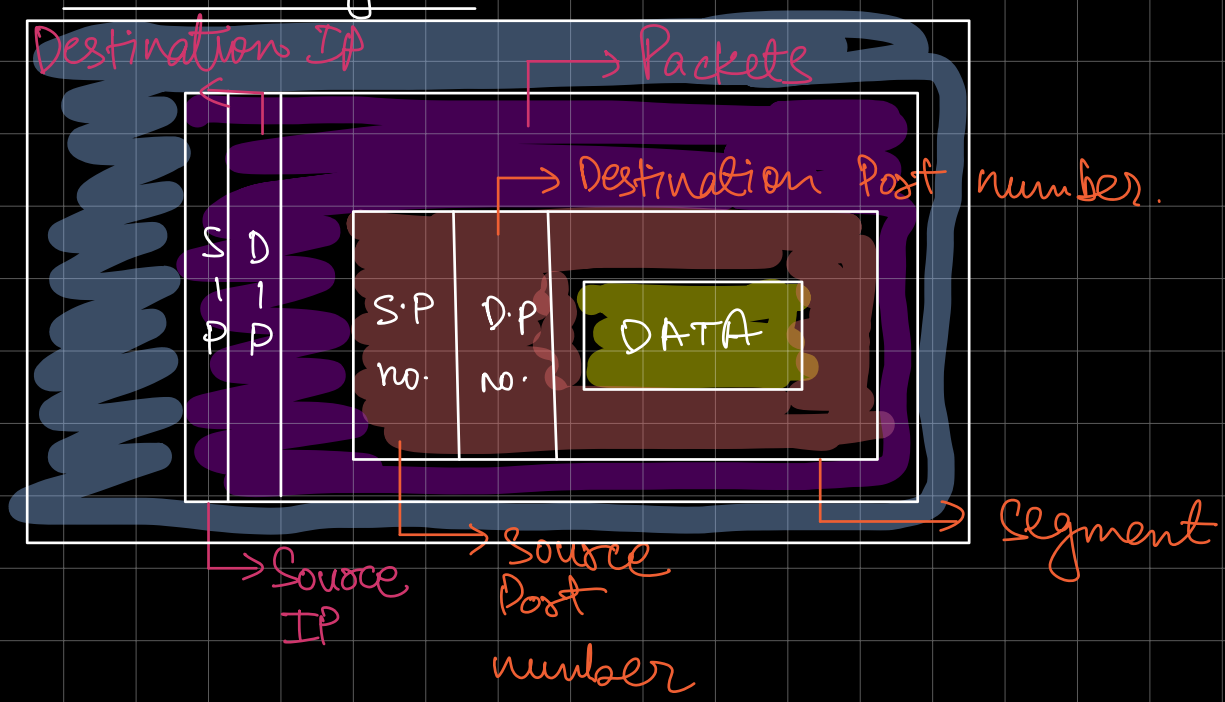
UDP

- We are just sending the data but not receiving the "acknowledgement" back.

"User Datagram Protocol"

– More reliable	– Not so reliable
– retransmits the data	– No retransmission
– Connection oriented	– Connectionless.
– larger size of the packet "20 bytes"	– less size of the Packet "8 bytes"
– Protocol number 6	Protocol number 17

- Network layer :- (Routers work here)



- Datalink layer: (Switches work here)
  - Packets are converted into "frames"
  - Adds "Source MAC address" & "destination MAC address".

- Physical layer :-
  - Converting them in the forms of bits.
  - Encoding & Decoding.
  - Converting them into signals.

Whole Scenario